



Chunghwa Picture Tubes, Ltd.

Technical Specification

To : WTE
Date : 2011/04/08

CPT TFT-LCD
CLAB 215FA01

ACCEPTED BY :

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1. OVERVIEW

CLAB215FA01 is 21.5" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit. By applying 6 bit digital data, 1920×1080, 16.7M-color images are displayed on the 21.5" diagonal screen. Input power voltage is 5.0V for LCD driving. General specification is summarized in the following table:

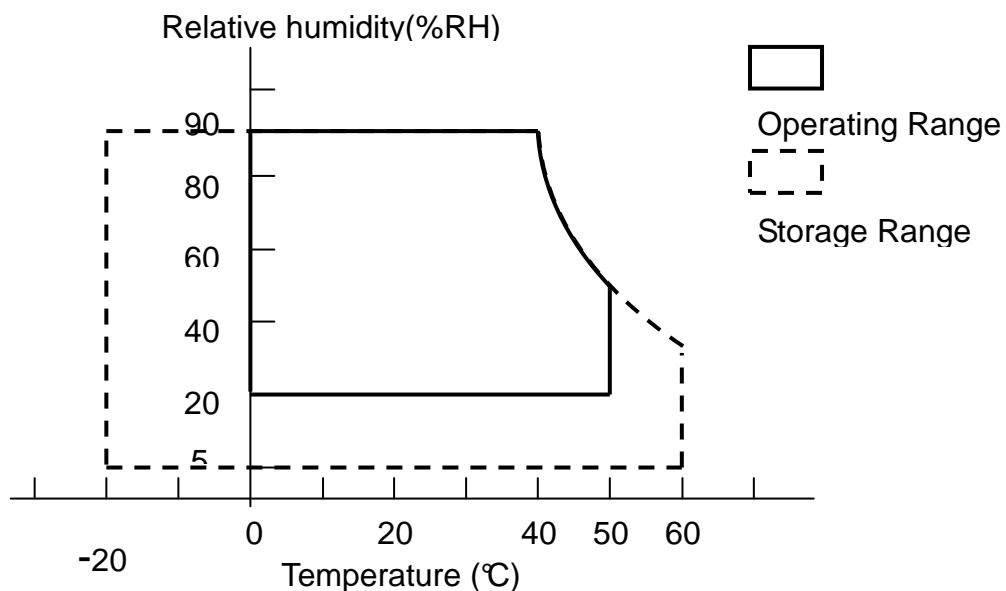
ITEM	SPECIFICATION
Display Area(mm)	476.64 (H) × 268.11 (V) (21.53-inch diagonal)
Number of Pixels	1920 (H) × 1080(V)
Pixel Pitch(mm)	0.24825 (H) × 0.24825 (V)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white, TN
Number of Colors	16.7M(6bits+Hi-FRC)
Brightness(cd/m ²)	300 cd/m ² (Typ.)(center, 7.5mA)
Viewing Angle(H/V)	170/160 (Typ.)
Surface Treatment	Anti-glare, 3H
Power consumption(W)	5W (Typ)

2. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
Power Supply Voltage for LCD	VCC	0	6	V	
Operation Temperature	Top	-30	85	°C	1). 2). 3). 4)
Storage Temperature	Tstg	-40	100	°C	1). 2). 3). 4)

[Note]

- 1)The relative temperature and humidity range are as below sketch, 90%RHMax.(Ta≤40°C).
- 2).The maximum wet bulb temperature ≤39°C(Ta>40°C) and without dewing.
- 3).If you use the product in an environment which over the definition of temperature and humidity too long to effect the result of eye-etching.
- 4) Test Condition: IEC 1000-4-2 VESDt: Contact discharge to input connector; VESD_C: Contact discharge to module
- 5). If you operate the product in normal temperature range, the center surface of panel should be under 60°C.



3. ELECTRICAL CHARACTERISTICS

(1).TFT-LCD

Ta=25°C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	REMARK
Power Supply Voltage for LCD	VCC	4.5	5.0	5.5	V	*1)
Power Supply Current for LCD	ICC	--	1000	1500	mA	*2)
Permissive Ripple Voltage for Logic	VRP	--	--	100	mVp-p	VCC=5.0V
Differential Resistance	Zm	90	100	110	Ω	
LVDS: IN+, IN-	The same motion input Voltage	VCM	1.125	1.25	1.375	V
	Differential input Voltage	VID	250	350	450	mV
	High electric potential threshold voltage	VTH	-	-	100	mV
	Low electric potential threshold voltage	VTL	-100	-	-	mV
LCD Irush Current	Irush	-	-	4	A	*4)
Power consumption	P	-	5	7.5	W	*2)

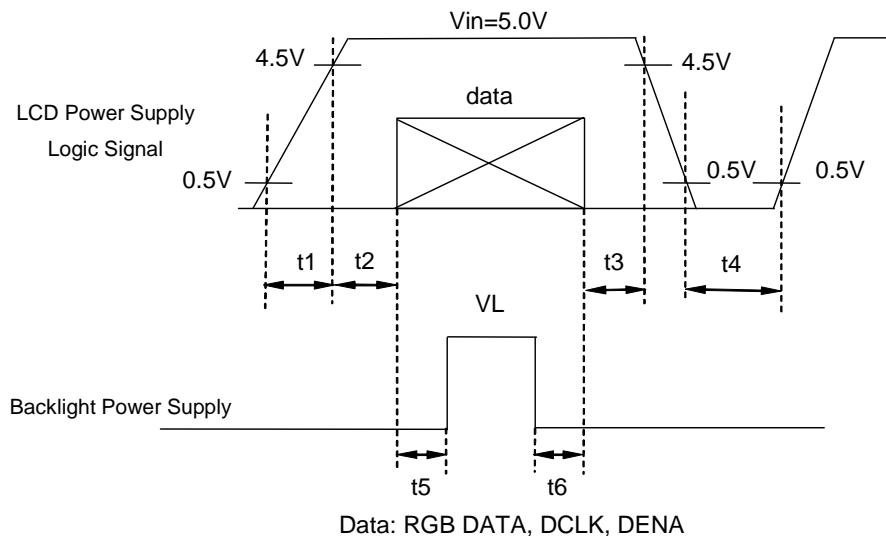
[Note]

*1)Power & data sequence

$$0.50\text{ms} \leq t_1 \leq 10\text{ms} \quad t_4 \geq 1 \text{ sec}$$

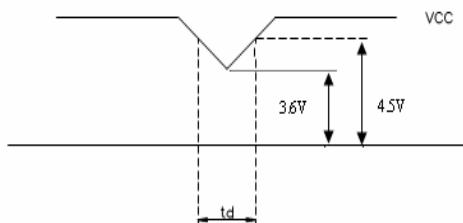
$$0.01\text{ms} < t_2 \leq 50\text{ms} \quad t_5 \geq 200\text{ms}$$

$$0.01\text{ms} < t_3 \leq 50\text{ms} \quad t_6 \geq 200\text{ms}$$



VCC-dip conditions:

- (1) When $3.6V \leq V_{cc}(\min) < 4.5V$: $t_d \leq 10$ ms
- (2) When $V_{cc} < 3.6$ V, VCC-dip conditions should also follow the VCC-turn-on conditions.

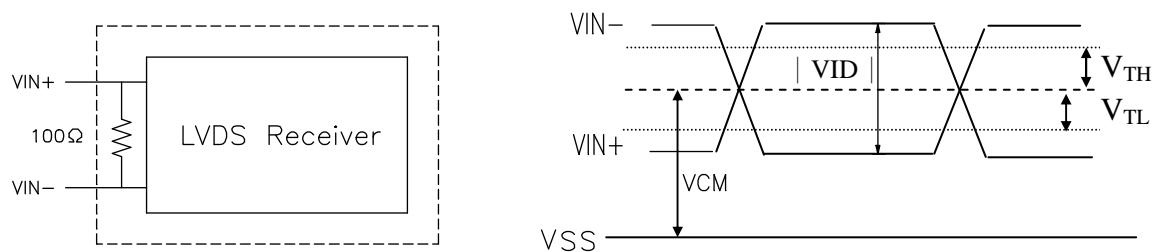


2). Typical value is measured when displaying horizontal gray scale line pattern:

64 gray level, 1920 line mode

$V_{CC}=5.0$ V , $f_H= 67.8$ kHz , $f_V=60$ Hz , $f_{CLK}=72$ MHz

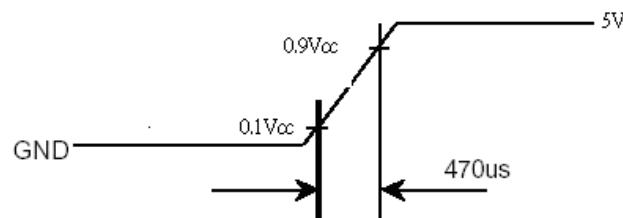
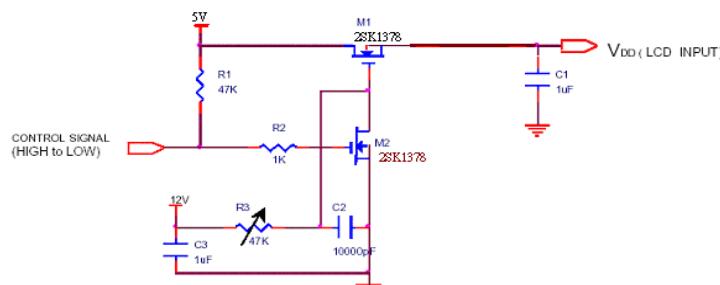
*3) LVDS Signal definition



$VIN+$: Positive differential DATA & CLK Input

$VIN-$: Negative differential DATA & CLK Input

*4).Irush Measurement Condition



4. INTERFACE PIN CONNECTION

(1) CN1

Outlet connector: GS2330-0312R-7F (FOXCONN) (or equivalent)

PIN NO.	REMARK	FUNCTION
1	RXO0-	minus signal of odd channel 0(LVDS)
2	RXO0+	plus signal of odd channel 0(LVDS)
3	RXO1-	minus signal of odd channel 1(LVDS)
4	RXO1+	plus signal of odd channel 1(LVDS)
5	RXO2-	minus signal of odd channel 2(LVDS)
6	RXO2+	plus signal of odd channel 2(LVDS)
7	GND	GND
8	RXOC-	minus signal of odd clock channel (LVDS)
9	RXOC+	plus signal of odd clock channel (LVDS)
10	RXO3-	minus signal of odd channel 3(LVDS)
11	RXO3+	plus signal of odd channel 3(LVDS)
12	RXE0-	minus signal of even channel 0(LVDS)
13	RXE0+	plus signal of even channel 0(LVDS)
14	GND	GND
15	RXE1-	minus signal of even channel 1(LVDS)
16	RXE1+	plus signal of even channel 1(LVDS)
17	GND	GND
18	RXE2-	minus signal of even channel 2(LVDS)
19	RXE2+	plus signal of even channel 2(LVDS)
20	RXEC-	minus signal of even clock channel (LVDS)
21	RXEC+	plus signal of even clock channel (LVDS)
22	RXE3-	minus signal of even channel 3(LVDS)
23	RXE3+	plus signal of even channel 3(LVDS)
24	GND	GND
25	NC	NC
26	NC	Test pin (Can't connect to GND)
27	NC	NC
28	VCC	Power supply input voltage(5.0 V)
29	VCC	Power supply input voltage(5.0 V)
30	VCC	Power supply input voltage(5.0 V)

- 1) Keep the NC Pin and don't connect it to GND or other signals.
- 2) GND Pin must connect to the ground, don't let it be a vacant pin.

5. INTERFACE TIMING

(1) Timing Characteristic

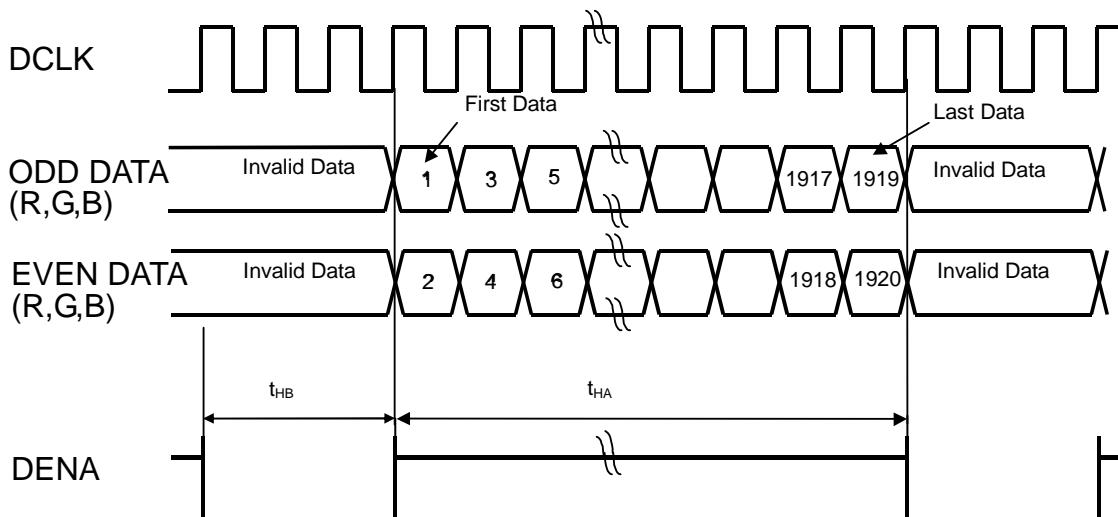
ITEM			SYMBOL	MIN.	TYP.	MAX.	UNIT
LCD Timing	DCLK	Freq.	f_{CLK}	55	72	90	MHz
		Cycle	t_{CLK}	18.18	13.89	11.11	ns
	Horizontal	Horizontal effective time	t_{HA}	960	960	960	t_{CLK}
		Horizontal blank time	t_{HB}	40	100	160	t_{CLK}
		Horizontal total time	t_H	992	1060	1075	t_{CLK}
	Vertical	Vertical frame Rate	Fr	50	60	75	Hz
		Vertical total time	t_V	1084	1130	1170	t_H
		Vertical effective time	t_{VA}	1080	1080	1080	t_H
		Vertical blank time	t_{VB}	10	50	150	t_H

[Note]

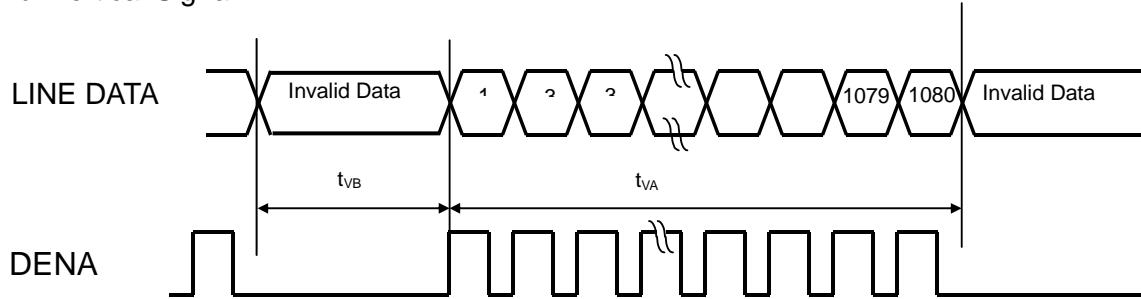
- *1) DENA (data enable) usually is positive
- *2) DCLK still inputs during blanking
- *3) LVDS transmitter IC: **HX8861-C06 (HIMAX)**
- *4) DE mode only
- *5) It maybe cause flicker at 50Hz.

(2).Timing Chart

a. Horizontal Signal

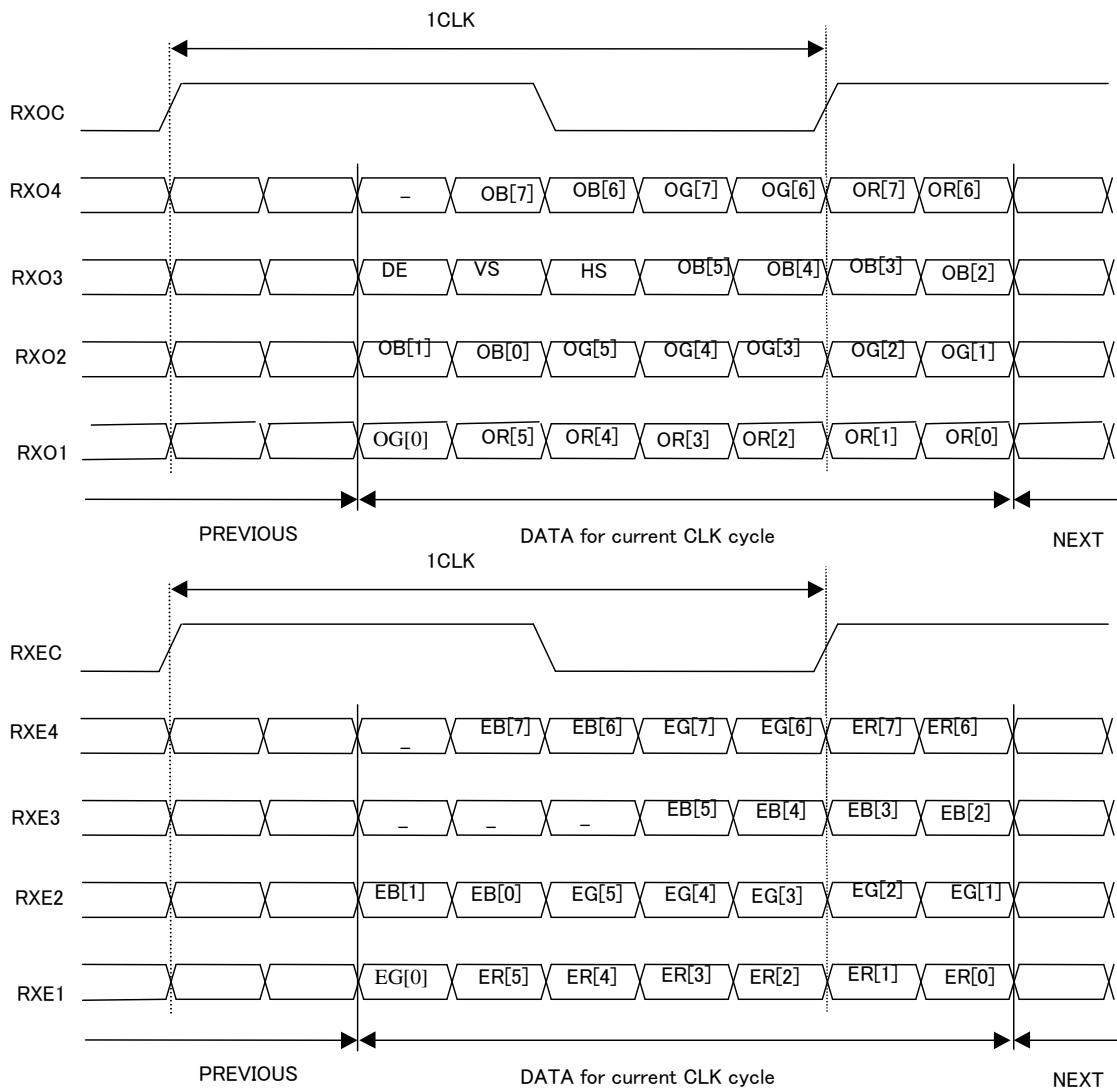


b. Vertical Signal



(3).LVDS Data

For 6Bit+Hi-FRC



Color Data Assignment

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7 MSB	R6	R5	R4	R3	R2	R1	R0 LSB	G7 MSB	G6	G5	G4	G3	G2	G1	G0 LSB	B7 MSB	B6	B5	B4	B3	B2	B1	B0 LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(254)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
BLUE	BLUE(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

[Note] 1) Definition of gray scale: Color (n): n indicates gray scale level; higher n means brighter level.

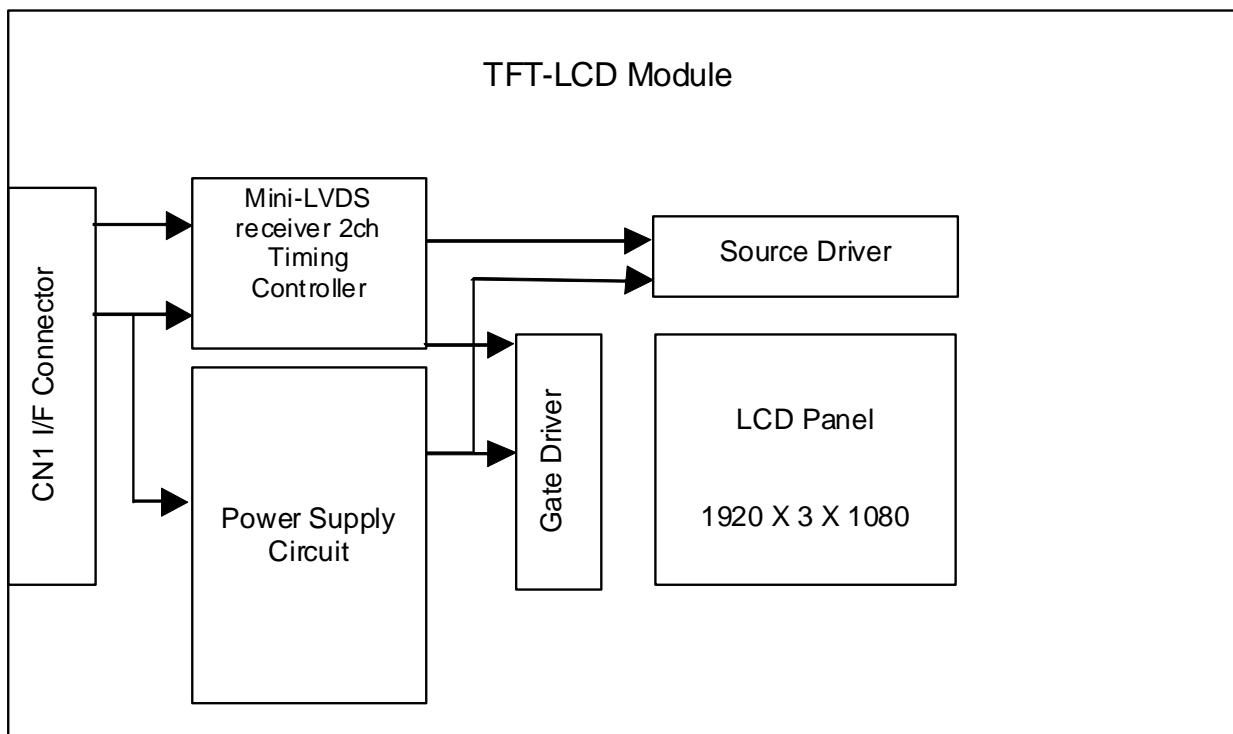
2) Data: 1-High, 0-Low.

3) For odd & even data also.

(4). Color Data Distribution

D(1,1)	D(2,1)	..	D(X,1)	..	D(1919,1)	D(1920,1)
D(1,2)	D(2,2)	..	D(X,2)	..	D(1919,2)	D(1920,2)
..	..	+	..	+
D(1,Y)	D(2,Y)	..	D(X,Y)	..	D(1919,Y)	D(1920,Y)
..	..	+	..	+
D(1,1079)	D(2, 1079)	..	D(X, 1079)	..	D(1919, 1079)	D(1920, 1079)
D(1, 1080)	D(2, 1080)	..	D(X, 1080)	..	D(1919, 1080)	D(1920,1080)

6. BLOCK DIAGRAM



7. MECHANICAL SPECIFICATION

(1) OLB Drawing (Tolerance is $\pm 0.5\text{mm}$ unless noted)

[Unit:mm]

